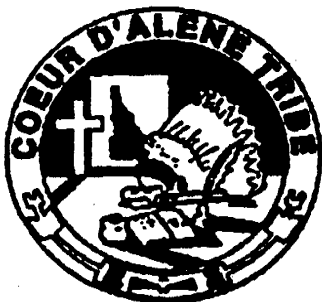


COEUR D'ALENE LAKE MANAGEMENT PLAN

Coeur d'Alene Tribe



Clean Lakes
Coordinating Council



Idaho Division of
Environmental Quality



COEUR D'ALENE LAKE

MANAGEMENT PLAN

Kootenai, Benewah and Shoshone Counties, Idaho

Approval, Recommendation, Policy Statements and Comments

The Clean Lakes Coordinating Council approves and recommends the Coeur d'Alene Lake Management Plan to the county commissions and the Coeur d'Alene Tribal Council. The council provides these additional policy statements and comments:

- That the Clean Lakes Coordinating Council is empowered to coordinate the implementation of the plan;
- That the council does not promote or support land use that degrades water quality, but encourages those land uses that protect this valuable resource;
- That recognizing that the timber and surface mining industries are the only land users which have mandatory best management practices (BMPs), we recommend that reasonable and mandatory BMPs be developed for other land users;
- That recognizing that each waterbody has somewhat different chemical characteristics, the council recommends that site specific water quality criteria be developed for the lake as funding permits.

Susan MacLeod 3-19-96 Robert Hammes 3-19-96

Susan MacLeod, Chairperson Date ~~Robert~~ Hammes Date

Orland P. Scott 3/19/96 Robert Hall 3/19/96

Dr. Orland P. Scott Date Robert Hall Date

Bill Seaton 3/19/96

Bill Seaton Date

COUNTY COMMISSIONS APPROVAL

ACCEPTED BY THE BENEWAH COUNTY BOARD OF COMMISSIONERS:

Jack Buell

Date

George Mills Jr.

Date

N.L. (Bud) McCall

Date

ACCEPTED BY THE KOOTENAI COUNTY BOARD OF COMMISSIONERS:

Dick Compton 9/19/96 *Dick Panabaker* 9/19/96
Dick Compton Date 9/19/96 Dick Panabaker Date 9/19/96

Bob Macdonald 9/19/96
Bob Macdonald Date 9/19/96

ATTEST

DANIEL J. ENGLISH, CLERK

BY: *Sherry Krulitz*

Deputy Clerk

ACCEPTED BY THE SHOSHONE COUNTY BOARD OF COMMISSIONERS:

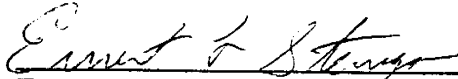
Sherry Krulitz 4/22/96
Sherry Krulitz Date

Jack King 4-22-96
Jack King Date

R. Gary Waters 4/22/96
R. Gary Waters Date

COEUR D'ALENE TRIBE APPROVAL
of the
COEUR D'ALENE LAKE MANAGEMENT PLAN

ACCEPTED BY THE COEUR D'ALENE TRIBE:

 7/8/96
Ernest L. Stensgar, Chairman Date

Resolution Number CDA 215-A (96)

APPROVAL OF LAKE MANAGEMENT PLAN

CDA Resolution 215(96)-A

WHEREAS, the Coeur d'Alene Tribal Council has been empowered to act for and on behalf of the Coeur d'Alene Tribe, pursuant to the Revised Constitution and By-Laws, adopted by the Coeur d'Alene Tribe by referendum, November 10, 1984, and approved by the Secretary of the Interior, Bureau of Indian Affairs, December 21, 1984; and

WHEREAS, the Coeur d'Alene Tribe assisted in the development of the Coeur d'Alene Lake Management Plan; and

WHEREAS, the management plan for Lake Coeur d'Alene is in its final format and has been reviewed by the Tribal staff and now requires acceptance by the Coeur d'Alene Tribal Council; and

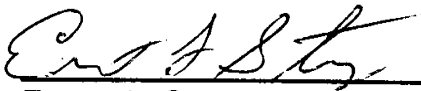
WHEREAS, the Coeur d'Alene Tribal Natural Resource Department recommends approval by the Tribal Council.

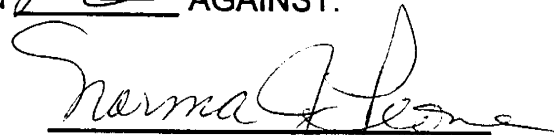
NOW THEREFORE BE IT RESOLVED, the Coeur d'Alene Tribal Council accepts the recommendation of the Natural Resource Department and approves the management plan prepared for Lake Coeur d'Alene; and,

FURTHER BE IT RESOLVED, that the Coeur d'Alene Tribal Council authorizes the Chairman to sign the Lake Management Plan for Coeur d'Alene Lake.

CERTIFICATION

The foregoing resolution was adopted at a meeting of the Coeur d'Alene Tribal Council held at the Tribal Headquarters, near Plummer, Idaho on June 27, 1996, with the required quorum present, by a vote of 6 FOR and 0 AGAINST.


Ernest L. Stensgar, Chairman
Coeur d'Alene Tribal Council


Norma Peone, Secretary
Coeur d'Alene Tribal Council

ACKNOWLEDGEMENTS

The Coeur d'Alene Lake Management Plan was developed through the combined efforts of citizens and governmental agencies coordinated under the umbrella of the Coeur d'Alene Basin Restoration Project. The core planning team included representatives of the commissions of Benewah, Kootenai and Shoshone Counties, the Clean Lakes Coordinating Council, Coeur d'Alene Tribe, Idaho Division of Environmental Quality and U. S. Geological Survey.

Scoping and informational meetings as well as a monthly newsletter were organized by the public involvement coordinators of the Coeur d'Alene Basin Restoration Project and Idaho Division of Environmental Quality. Several members of the Citizen's Advisory Committee of the Coeur d'Alene Basin Restoration Project gave informational talks on the lake and the planning effort to numerous business groups and civic organizations. The technical advisory groups which developed the plan's action items were facilitated by staff of the Clean Lakes Coordinating Council, Coeur d'Alene Basin Restoration Project, Coeur d'Alene Tribe, Idaho Division of Environmental Quality and Panhandle Health District.

Agency and citizen participants in the technical advisory groups numbered over eighty. These agencies and individuals are listed in Appendix A of the plan.

FORWARD

Participation of the Coeur d'Alene Tribe in the development and implementation of this lake plan is part of the Tribe's involvement as one of the three sovereign powers in the Coeur d'Alene Basin Restoration Project. As documented in the Memorandum of Understanding (MOA) between the U.S. EPA, State of Idaho and Coeur d'Alene Tribe, October 29, 1992, all three parties recognize that each reserves all rights, powers and remedies by statute, treaty and otherwise. As derived from various legal and treaty remedies, the Coeur d'Alene Tribe retains its long standing claim in law over the bed and banks of Coeur d'Alene Lake.

Neither the Coeur d'Alene Lake Plan nor any action pursuant to the plan shall be construed as an admission by the Tribe as to the respective rights or legal authority of the Tribe with respect to Coeur d'Alene Lake's waters, bed or banks. This lake plan is intended to facilitate joint action and inter-governmental coordination among the parties, and neither creates any rights nor gives rise to any right of judicial review.

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GLOSSARY

aerobic:	Describes life or processes that require the presence of molecular oxygen.
algae:	Small aquatic plants lacking stems, roots, or leaves which occur as single cells, colonies, or filaments.
algal bloom:	Rapid, even explosive, growth of algae on the surface of lakes, streams, or ponds.
anaerobic:	Describes processes that occur in the absence of molecular oxygen.
anoxic:	A condition of no oxygen in the water. Often occurs near the bottom of fertile lakes in the summer and under ice in the winter.
bathymetric map:	A map showing the bottom contours and depths of a lake.
beneficial use:	Any of the various uses which may be made of water, including, but not limited to, domestic water supplies, industrial and agricultural water supplies, recreation in and on the water, wildlife habitat, and aesthetics.
benthic:	The bottom of lakes, stream or ponds.
best management practices:	Accepted methods for controlling nonpoint source pollution; may include one or more conservation practices.
bioassay:	A procedure used to test the effects on growth and survival of organisms exposed to a range of substances with nutritional or toxic effects.
biochemical oxygen demand (BOD):	The rate of oxygen consumption by organisms during the decomposition of organic matter.
biomass:	The weight of biological matter such as phytoplankton, macrophytes, or fish.
biota:	All plant and animal species occurring in a specified area.
chlorophyll:	The primary photosynthetic pigment in plants; often used as a measure of aquatic plant production.
coliform bacteria:	A group of bacteria found in the colons of animals and humans, but also in natural soil and water where organic content is high. The presence of coliform bacteria in water is an indicator of possible pollution by fecal material.

decomposition:	The transformation of organic material to inorganic material through biological and non-biological processes.
discharge:	Outflow of water; related terms are runoff, streamflow, and yield.
dissolved oxygen:	Molecular oxygen freely available in water and necessary for the respiration of aquatic life and the oxidation of organic materials.
dissolved oxygen depletion:	The process in a lake whereby respiration and decomposition demands on oxygen are greater than the supply of dissolved oxygen generated from atmospheric reaeration and photosynthetic production.
drainage basin:	The land area contributing runoff to a stream or other body of water; generally defined in terms of surface area. ie., square miles.
ecology:	Scientific study of relationships between organisms and their environment.
ecosystem:	A system of interrelated organisms and their physical-chemical environment.
epilimnion:	Uppermost, warmest, well-mixed layer of a lake formed by summer thermal stratification. Extends from lake surface to thermocline depth.
environment:	Collectively, the surrounding conditions, influences, and living and inert matter that affect a particular organism or biological community.
erosion:	The wearing away of the landscape into smaller particles (sediment) by water, wind, ice, or gravity.
euphotic zone:	The upper water column in a lake that receives enough sunlight so the photosynthetic carbon production by phytoplankton exceeds their respiratory needs.
eutrophic:	Nutrient rich and generally referring to a fertile, productive body of water.
eutrophication:	The natural process by which lakes and ponds become enriched with nutrients, resulting in increased growth of algae and reduced water clarity. If the process is accelerated by human activities it is termed cultural eutrophication.
floodplain:	Land adjacent to lakes or rivers that is covered as water levels rise and overflow the normal water channels.
hardness:	A property of water referring to the amount of dissolved minerals such as

calcium and magnesium. Increasing hardness tends to counteract the toxicity of some heavy metals.

hypolimnion: Lower, cooler layer of a lake. Extends from thermocline to lake bottom.

inorganic nitrogen: The sum of nitrite, nitrate, and ammonia nitrogen. The nitrogen most readily available as a nutrient for algae.

lake management: The practice of keeping lake quality in a state such that attainable uses can be achieved.

lake restoration: The act of bringing a lake back to its attainable uses.

limnetic zone: The open, deeper areas of a lake, exclusive of the shallow, shoreline areas.

limnology: Scientific study of fresh water, especially the history, geology, biology, physics, and chemistry of lakes.

littoral zone: The shallow areas of a lake adjacent to its shoreline and extending to the greatest depth occupied by rooted aquatic plants.

loading: The amount of a substance, usually nutrients or sediment, discharged past a point; expressed as weight per unit time.

macrophytes: Rooted and floating aquatic plants, commonly referred to as water weeds.

metalimnion: Layer of rapid temperature change in a thermally stratified lake. Located between the epilimnion and hypolimnion and contains the thermocline.

mesotrophic: Moderate nutrients and generally referring to a moderately fertile body of water.

model: A mathematical procedure, commonly executed on a computer, that mimics the functioning of a real system such as a lake and its contributing drainage basin.

morphometry: Relating to a lake's physical characteristics such as surface area, volume, maximum depth, and shoreline length.

nitrogen: An essential nutrient for aquatic organisms; comprises about 80 percent of the earth's atmosphere.

nonpoint source pollution: Pollution discharged from a wide land area, not from a specific point.

nutrient budget:	Quantitative assessment of nutrients (usually nitrogen and phosphorus) moving into, being retained, and moving out of an ecosystem such as a lake.
nutrient loading:	The addition of nutrients, usually nitrogen or phosphorus, to a water body.
nutrients:	Elements or compounds essential to life, including but not limited to carbon, nitrogen, phosphorus, and trace elements.
oligotrophic:	Nutrient poor and generally referring to an infertile, unproductive body of water.
orthophosphorus:	The phosphorus ion most readily available as a nutrient for algae.
organic matter:	Materials produced by plants and animals and containing linked carbon atoms and elements such as hydrogen, nitrogen, sulfur and phosphorus.
phosphorus:	An essential nutrient for aquatic organisms, usually derived from weathered rock.
phytoplankton:	Microscopic aquatic plants freely suspended in the water column.
point source pollution:	Pollutants discharged from an identifiable point such as pipes, ditches, channels, sewers, tunnels and containers of various types.
pollution:	Any alteration in the character or quality of the environment which renders it unfit or less suited for beneficial uses.
secchi disc transparency:	The depth at which an 8-inch diameter black and white disc suspended in the water column is no longer visible from the water surface; a measure of water transparency.
sediment:	Fragmented organic and inorganic material, removed by erosion and transported by water, wind, ice and gravity.
stormwater runoff:	Surface water runoff, usually associated with urban development, which carries both natural and human-caused pollutants.
stratification:	Layering of water caused by differences in water density. Thermal stratification is typical of most lakes during the summer; chemical stratification is less common.
thermocline:	A horizontal plane across a lake at the depth of the most rapid vertical

change in temperature. By common definition, thermocline is formed when temperature decline is equal to or greater than 1 degree Celsius per meter of depth change.

trace elements:	Elements which are required in minute amounts as nutrients; in excess they are often toxic. Often refers to heavy metals.
trophic state:	Referring to the nutritional status of a water body and categorized as oligotrophic, mesotrophic and eutrophic.
wastewater:	Treated or untreated sewage, industrial waste or agricultural waste.
water column:	Water in the lake between the interface with the atmosphere at the surface and the interface with the sediment layer at the bottom.
water quality standard/criteria:	Legally mandated and enforceable maximum contaminant levels of chemical, physical and biological parameters for water.
water quality:	A term used to describe the chemical, physical and biological characteristics of water with respect to its suitability for a beneficial use.
wetlands:	Lands where water saturation of the soil for at least part of the year is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the surrounding environment.
zooplankton:	Small animals, often microscopic, that float freely in lake water and graze on detritus, bacteria and algae and are, in turn, consumed by fish.

DEFINITION OF ACRONYMS

Numerous acronyms are used throughout the document. They are defined as follows:

- * ACOE, U.S. Army Corps of Engineers
- * ACP, Agricultural Conservation Program
- * ASCS Agricultural and Stabilization Service
- * BC, Benewah County
- * BLM, U.S. Bureau of Land Management
- * CAC, Citizen's Advisory Committee for CBIG,
- * CBIG, Coeur d'Alene Basin Interagency Group
- * CBRP, Coeur d'Alene Basin Restoration Project
- * CES, Cooperative Extension Service, University of Idaho
- * CLCC, Clean Lakes Coordinating Council
- * CT, Coeur d'Alene Tribe
- * DEQ, Idaho Division of Environmental Quality
- * EPA, U.S. Environmental Protection Agency
- * FG, Idaho Department of Fish and Game
- * FPA, Idaho Forest Practices Act
- * FPAAC, Forest Practices Act Advisory Committee
- * ICL, Idaho Conversation League
- * IDHW, Idaho Department of Health and Welfare
- * IDL, Idaho Department of Lands
- * DWR, Idaho Department of Water Resources
- * IFC, Idaho Forestry Council
- * ILA, Idaho Loggers Association
- * IPR, Idaho Department of Parks and Recreation
- * ITD, Idaho Department of Transportation
- * IWR, Idaho Department of Water Resources
- * KC, Kootenai County
- * NIBCA, North Idaho Building Contractors Association
- * NRCS, Natural Resource Conservation Service
- * NRDA, Natural Resources Damage Assessment
- * PAC, Panhandle Area Council
- * PHD, Panhandle Health District
- * AWQP, State Agricultural Water Quality Program
- * SC, Shoshone County
- * SCD, Soil Conservation Districts
- * UI, University of Idaho
- * USCG, U.S. Coast Guard
- * USDA, U.S. Department of Agriculture
- * USFS, U.S. Forest Service
- * USFWS, U.S. Fish and Wildlife Service
- * USGS, U.S. Geological Survey
- * WPCA, Water Pollution Control Account
- * WWC, Waterways Commission
- * WWP, Washington Water Power.

COEUR D'ALENE LAKE MANAGEMENT PLAN

EXECUTIVE SUMMARY

INTRODUCTION

The lake management study was initiated in 1991 in response to long-term concerns over water quality degradation. These concerns centered around increases in nutrients, which resulted in increased plant growth, decreased water clarity and heavy-metal contamination of lakebed sediments. The study was funded and conducted cooperatively by the U.S. Geological Survey, Idaho Division of Environmental Quality, and Coeur d'Alene Tribe. It had three objectives:

- 1) Determine the lake's ability to receive and process nutrients (phosphorus and nitrogen) in order to devise means to prevent declines in water quality;
- 2) Determine the potential for the release of heavy metals from lakebed sediments into the overlying lake water; and
- 3) Develop a lake management plan that will identify actions needed to meet water quality goals.

The agencies cooperating to develop the Lake Coeur d'Alene Management Plan sought to develop a comprehensive plan addressing water quality and non-water quality issues. A comprehensive treatment of water quality issues was developed, but recreational, access, aesthetic and use issues were not fully addressed. The body of this document is Part

1 of the plan addressing water quality. Part 2 of the plan requires further development although some action items addressing non-water quality problems were developed by the technical advisory groups who developed part 1 of the plan.

WATER QUALITY MANAGEMENT ZONES AND GOALS

Viewed as a whole, Coeur d'Alene Lake exhibits relatively high water quality. Yet both the study data and public and agency perceptions reveal specific geographical areas of concern and specific water quality problems. It is not appropriate to apply a single management strategy to the entire lake and watershed. Therefore, the lake has been divided into four water quality management zones. Each zone focuses on specific issues, goals, and management approaches pertinent to that zone. The four zones are:

- 1) **Nearshore** (water depths less than 20 feet)
- 2) **Shallow, southern lake** (south of the mouth of the Coeur d'Alene River and including the shallow lakes such as Benewah, Chatcolet, Hidden, and Round)
- 3) **Lower rivers** (lower reaches of the St. Joe and Coeur d'Alene Rivers that are affected by backwater from the lake)
- 4) **Deep, open water** (north of the mouth of the Coeur d'Alene River)

Water quality issues within the **nearshore management zone** include, but are not limited to: excessive growth of microscopic

aquatic plants attached to underwater materials (periphyton), excessive growth of large aquatic plants (macrophytes), bacterial contamination, protection of drinking water drawn from the lake, toxicity of heavy metals, and lake level fluctuations. Zinc levels in the water currently exceed levels identified by federal criteria as harmful to freshwater aquatic life.

Water quality issues within the shallow, **southern lake management zones** include, but are not limited to: depletion of dissolved oxygen, presence of high concentrations of heavy metals in the lakebed sediments, toxicity of heavy metals to aquatic life in the lakebed and lake water, sedimentation, reduced water clarity, and excessive growth of aquatic plants. The heavy metal concerns are restricted to the area north of Conkling Point. Zinc concentration exceeds criteria protective of aquatic life. Freshwater insects, fish, and animals that live in other areas of the lake are curtailed in much of the southern lake during the summer because of dissolved oxygen depletion.

Water quality issues within the **lower rivers management zone** include, but are not limited to: bank erosion, nutrient loading from nonpoint pollution sources, excessive growth of aquatic plants, and bacterial contamination. In the Coeur d'Alene River, heavy metal contamination of the riverbank sediments and water is very high; levels of zinc, cadmium, copper, and lead exceed levels identified as harmful for aquatic life by federal criteria. In addition, lead levels in the Coeur d'Alene River water exceed federal drinking water standards for humans; however, these criteria are applicable at the tap, not in the water body.

Water quality issues within the **deep, open water management zone** include, but are not limited to: depletion of dissolved oxygen in the summer, presence of high concentrations of heavy metals in the lakebed, and toxicity of heavy metals to aquatic life in the lakebed and lake water. Levels of zinc in the lake water exceed freshwater life criteria. Concentrations of cadmium, lead, and zinc in hypolimnetic water, exceed federal acute and/or chronic criteria for aquatic life.

In each of the four management zones, the public has chosen **the goal of "slow improvement in water quality."** Goals of "no action" or "maintain current water quality" were not legally acceptable because of state and federal water quality criteria and standards have been exceeded. The goal of "rapid improvement in water quality" was rejected because of implementation costs.

The environmental factors controlling phytoplankton algae production in lakes are numerous; nutrients, particularly phosphorus, have repeatedly been found to be major factors. Trace elements have infrequently been reported as significantly affecting phytoplankton production, either as a nutritional deficiency or as a toxicant. In the case of Coeur d'Alene Lake, the phytoplankton bioassays indicated that the biologically available, dissolved concentrations of zinc in the northern two-thirds of the lake exert a strong suppression on phytoplankton growth. Similar results were reported by two studies conducted on the lake in the early 1970's. These results raise an important issue for water quality management in Coeur d'Alene Lake: If zinc concentrations were reduced to comply with federal water quality criteria, would the

lake's phytoplankton production markedly increase? If the answer to the question is affirmative, then nutrient loadings would need to be reduced, perhaps significantly, in order to counteract the lifting of zinc's suppressive effect on phytoplankton production.

TRENDS IN LAKE WATER QUALITY

Despite the issues and concerns listed, Coeur d'Alene Lake's water quality has improved during the last 15-20 years. This positive trend is attributable to the enactment of environmental laws by federal, state, and local governments, and a growing societal awareness of environmental issues. Settling ponds for mining and smelting wastes were installed in the late 1960's and effective sewage treatment began in the Silver Valley in the mid-1970's and into the 1980's. State and local standards for subsurface sewage disposal were also made more stringent. State laws now require the use of best management practices (BMPs) for reducing water quality effects of timber harvest activities. Encouraged by economics, as well as by state and federal programs, agricultural practices that reduce erosion and sedimentation have also come into more widespread use. All of these factors, along with a growing environmental awareness and the transition to an economy less dependent on natural resources extraction, have contributed to the recent improving trend in water quality in Coeur d'Alene Lake.

Coeur d'Alene Lake has become visibly "cleaner" in recent years, but the potential exists for serious and widespread water quality degradation given present trends in population growth and lake use, coupled with the extent of past pollution. Significant

depletion of dissolved oxygen still occurs in deep, bottom waters during the late summer. The shallow, southern lake area and several bays are becoming shallower because of sediment eroded from agricultural and timber lands as well as from nearshore areas being developed for residential and recreational uses. Southern lake waters are becoming infested with aquatic plants. Excessive growth of attached algae can be seen on shoreline rocks, docks, and boats in some nearshore areas. Sewage treatment facilities in the basin still contribute a significant portion of the lake's potentially controllable nutrient load. The bed and banks of the lower reaches of the Coeur d'Alene and St. Joe Rivers continue to be eroded and transport heavy loads of sediment and nutrients into the lake. Much of the bottom of the lake is blanketed with sediment containing high levels of heavy metals as well as substantial amounts of nutrients. Contaminated wastes from past mining in the Coeur d'Alene River drainage continue to flow into the lake in sizeable amounts. Perhaps the greatest threat to Coeur d'Alene Lake is the potential for reversal of the recent improvements in water quality. Such a reversal could be brought on by the rapid increases in lake use, population growth, and land development now occurring throughout the basin. Unless preventative measures are initiated soon, the recent improvements in lake water quality could be eroded or lost.

RECOMMENDED MANAGEMENT ACTIONS

The public was involved in the lake management planning process via its participation on the following five technical advisory groups (TAGs): forest practices, agriculture, development (with a recreation

subgroup), southern lake, and rivers. Each TAG considered water quality issues and management goals and then developed management actions to achieve those goals. About 80 people participated. They represented local, state and federal agencies, industry, environmental organizations, and community and business associations. The management actions developed by the TAGs were then applied to the appropriate water quality management zones.

Management goals for the **nearshore zone** is to be achieved with management actions developed by the TAGs for forest practices, agriculture, and development. The majority of these management actions involve application of BMPs to control erosion from small watersheds that feed the lake. Reductions will also be sought for nutrient inputs from nearshore domestic septic systems and municipal wastewater treatment plants.

Within the shallow, **southern lake zone**, management goals can be achieved by reducing the nutrient loads within the lakebed sediments, contributed by watersheds plus erosion of riverbanks and lakeshores. Mechanical harvesting can be employed to periodically remove nutrients contained in the abundant aquatic macrophytes which grow in this zone. Nutrient loads from contributing watersheds can be reduced by application of BMPs on agricultural and forested lands. Additional reductions can be gained by upgrading several municipal wastewater treatment plants that contribute nutrient loads to this zone. To reduce erosion of riverbanks and the lakeshores, the southern lake TAG suggests establishment of "no wake" zones and management of boat traffic within this zone.

The management goals for the **lower rivers zone** will be achieved by reducing accelerated riverbank erosion by **25 percent** in the St. Joe River and by **50 percent** in the Coeur d'Alene River over the next decade. After acquiring better knowledge on the location and severity of erosion, bank stabilization projects can be undertaken, probably with assistance from the Army Corps of Engineers. Educational materials will be developed to inform boat operators of ways they can reduce their negative impacts on riverbanks. Landowners will be informed of riverbank stabilization methods they can employ which have been approved by the Corps of Engineers.

The deep, **open water zone** integrates the water quality effects of natural and human influences throughout the basin. Management goals for this zone will be achieved partially by management actions undertaken within the other three zones; however, the majority of the lake's nutrient loading comes from the Coeur d'Alene and St. Joe River basins. Within these two basins, important management actions to be implemented include erosion control from forested lands and reductions in nutrient loadings from municipal wastewater treatment plants. Formation of a lake basin commission is suggested as a means to coordinate the diverse, incremental efforts that will be required to achieve the long-term goals of the lake management plan.

Numeric Values for current, desired, and criteria/standards-based water quality conditions in the deep, nearshore management zone.

	Desired Condition ¹¹	Current Condition ¹	Standard or Recommended Level ¹⁰
Dissolved Oxygen (mg/L) ²	8.6	8.6	6.0 ³
Total P (μ g/L)(ppb) ²	5-10	5.0 ⁸	25.0
Zinc (μ g/L)(ppb) ²	32.7	56	32.7
Clarity (Secchi depth meters)	7.6	7.6 ⁴	none
Coliform bacteria	500/100 ml	-	500/100 ml ⁵
	200/100 ml	-	200/100 ml ⁶
	50/100 ml	-	50/100 ml ⁷

1. Average condition of 19 bays unless otherwise noted.
2. Seven-day average.
3. Standard applies to all waters except the lowest 7 meters of the water column at depths greater than 35 meters.
4. Average of 19 bays 7.6 meters; worst case Fuller's 5.2 meters.
5. At any time.
6. In no more than 10% of the samples taken over a 30 day period.
7. Geometric mean of samples taken over a 30 day period.
8. Average total phosphorus for 19 bays over two years; worst case, Kidd Island Bay, 16 μ g/L.
9. Average of 19 bays; worst case Kidd Island Bay, 150/100ml.
10. Standard based Idaho Water Quality Standards and wastewater treatment requirements, EPA "Gold Book" criteria (as interpreted by National Toxic Rule) or phosphorus levels recommended to prohibit nuisance aquatic weed growth.
11. Based on interpretation of Idaho Antidegradation policy and special resource waters designation of Lake Coeur d'Alene.
12. Trace (heavy) metals criteria are based on the hardness (mg/L CaCO₃) of the waterbody for which it is applied. The criteria is calculated as a function of the exponential of the logarithm of the hardness value. The National Toxic Rule and proposed Idaho water quality standards for metals operate in a hardness range of 25 to 400 mg/L CaCO₃ (Federal Register 57: 246, 1/22/92, 60917). The zinc goal developed for drafts of the Coeur d'Alene Lake Management Plan was calculated to be 18.4 μ g/L based on the incorrect use of the lake hardness which averages 19 mg/L. Based on the National Toxics Rule, under which Idaho is currently listed, and proposed Idaho water quality standards, the criteria should be calculated at a hardness of 25 mg/L CaCO₃. The correct zinc criteria is 32.7 μ g/L.

Numeric Values for current, desired, and criteria/standards-based water quality conditions in the shallow, **southern-lake management zone**.

	Desired Condition ⁶	Current Condition ¹	Standard or Recommended Levels
Dissolved Oxygen (mg/L) ²	8.4	8.4	6.0
Total P ($\mu\text{g/L}$) ²	12.0	18.3 ⁴	25.0 ⁵
Zinc ($\mu\text{g/L}$)(ppb) ^{2,3}	32.7	39.0	32.7
Clarity (Secchi depth meters)	4.0	3.0	none

1. Average of Chatcolet and Blue Point Stations unless otherwise noted.
2. Seven-day average.
3. Applies to area of southern lake north of Conkling Point.
4. Average total phosphorous = $18.3 \mu\text{g/L}$; worst case Chatcolet Lake $26.9 \mu\text{g/L}$.
5. Standard based on Idaho water quality standards and wastewater treatment requirements, EPA "Gold Book" criteria (as interpreted by National Toxic Rule) or phosphorus levels recommended to prohibit nuisance aquatic weed growth.
6. Based on interpretation of Idaho Antidegradation policy and special resource water designations of Lake Coeur d'Alene.

Numeric Values for current, desired, and criteria/standards-based water quality conditions in the deep, **open-water management zone**.

	Desired Condition ⁹	Current Condition ¹	Standard or Recommended Level ⁸
Dissolved Oxygen (mg/L) ²	7.0	7.0	6.0 ³
Total P (μ g/L)(ppb) ²	9.0	9.0	25.0
Zinc (μ g/L)(ppb) ²	32.7	143	32.7
Clarity (Secchi ² depth meters)	6.0	6.0 ⁴	none
Coliform bacteria	500/100 ml	-	500/100 ml ⁵
	200/100 ml	-	200/100 ml ⁶
	50/100 ml	-	50/100 ml ⁷

1. Average of values of Tubbs Hill, Wolf Lodge, Driftwood and University Point Stations.
2. Seven-day average.
3. Standard applies to all waters except the lowest 7 meters of the water column at depths greater than 35 meters.
4. Worst case during winter runoff at University Point, Station 1.0 meters.
5. At any time.
6. In no more than 10% of the samples taken over a 30 day period.
7. Geometric mean of samples taken over a 30 day period.
8. Standard based on Idaho water quality standards and wastewater treatment requirements EPA "Gold Book" criteria (as interpreted by National Toxic Rule) or phosphorus levels recommended to prohibit nuisance aquatic weed growth.
9. Based on interpretation of Idaho Antidegradation policy and special resource water designation of Lake Coeur d'Alene.

COEUR D'ALENE LAKE ASSESSMENT

INTRODUCTION

Coeur d'Alene Lake, Idaho's second largest, is located in northern Idaho within the 6,680 square miles (17,300 square kilometer) Spokane River drainage basin (fig. 1). The lake has become a prime recreational site for northern Idaho and eastern Washington because of its beautiful setting and proximity to the cities of Spokane (1990 population of about 362,000) and Coeur d'Alene (1990 population of about 25,000). Extensive residential and commercial development in its drainage basin and shoreline, plus intensive recreational use of Coeur d'Alene Lake have created considerable concern over the potential for nutrient enrichment and subsequent eutrophication of the lake.

A nutrient loading study done in 1975 classified Coeur d'Alene Lake as mesotrophic, or moderately productive, and recommended that additional studies of the sources and magnitudes of nutrient loadings be performed prior to development of a lake management plan (U.S. Environmental Protection Agency, 1977). Coeur d'Alene Lake has also been the recipient of trace-element-enriched mining and smelting wastes that were produced over 100 years by mining and ore-processing activities in the Coeur d'Alene River drainage basin. Studies in the early 1970's (Funk and others, 1973, 1975) found high concentrations of trace elements in the lakebed sediments in the northern two-thirds of the lake.

Eutrophication and the deposition of trace elements in Coeur d'Alene Lake may appear to

be unrelated water quality problems. However, large quantities of trace elements and nutrients can be released from lakebed sediments into the overlying water if eutrophication increases the lake's hypolimnetic dissolved oxygen deficits. Oxygen deficits were measured in Coeur d'Alene Lake in 1979 (Rieman, 1980) and 1987 (Woods, 1989). The trace elements in the lakebed of Coeur d'Alene Lake probably cannot be removed in an economically or environmentally-sound manner; therefore, the principal means of keeping the metals in the lakebed is to manage the lake's nutrient income to curtail development of anaerobic conditions.

Idaho's recently enacted Nutrient Management Act requires that a nutrient management plan be developed for Coeur d'Alene Lake. The Act requires the plan to:

- 1) identify nutrient sources;
- (2) identify the dynamics of nutrient removal, use, and dispersal; and
- (3) identify preventative or remedial actions where feasible and necessary to protect surface water.

The Idaho Department of Health and Welfare, Division of Environmental Quality was given responsibility for development of the nutrient management plan. They requested assistance from the U.S. Geological Survey for development of the data base necessary to produce the management plan. The Coeur d'Alene Tribe also requested assistance from the U.S. Geological Survey to advise them on the status of eutrophication in the southern end of the lake. Therefore, a cooperatively-funded study of the lake was conducted during 1991-93 by the U.S. Geological Survey, Division of Environmental Quality, and the Coeur d'Alene

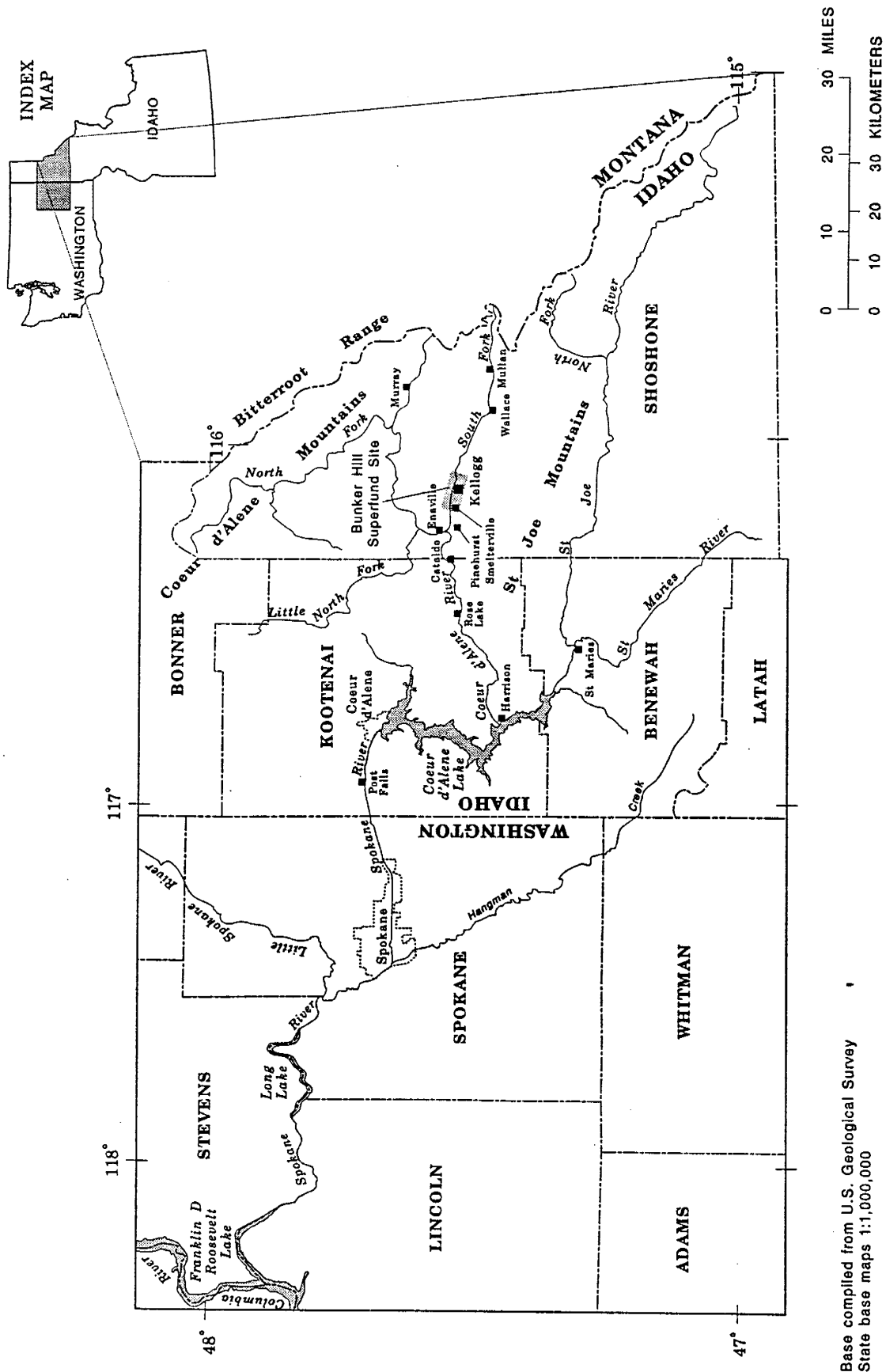


Figure 1. Location of Coeur d'Alene Lake, northern Idaho.

Tribe. The major results of the study are summarized later in this report.

Development of the lake management plan began upon completion of the lake study. A lake management plan workgroup was formed in early 1993. It has used the results of the lake study to guide the plan's overall development.

The workgroup is composed of representatives from Idaho Division of Environmental Quality, Coeur d'Alene Tribe, U.S. Geological Survey, Clean Lakes Coordinating Council (CLCC), Coeur d'Alene Basin Restoration Project, and commissioners from Benewah, Kootenai, and Shoshone Counties. Public input to the plan was received through a series of public meetings and reviews by citizen-staffed technical advisory groups. The results of those endeavors have resulted in this document, the Coeur d'Alene Lake Management Plan.

The goal of the management agencies was to develop a Lake Coeur d'Alene Management Plan which addressed water quality as well as non-water quality issues. Part 1 of the plan would address water quality issues, while Part 2 would focus on issues of recreation, access, aesthetics and general use. The plan presented is a water quality plan for the lake. The action items addressing non-water quality issues, developed primarily by the recreation technical advisory groups, have been retained in appendix C. These action items will form a starting point for development of a comprehensive plan addressing the numerous recreation, access, aesthetics and use issues.

DESCRIPTION OF LAKE AND ITS WATERSHED

PHYSICAL ATTRIBUTES

The 3,980 square miles (10,310 square kilometer) study area is located within Benewah, Kootenai, and Shoshone Counties in northern Idaho and Spokane County in eastern Washington (fig. 1). The Bitterroot Range composes the majority of the study area. The Range is characterized by high, massive mountains mantled with coniferous forests and deep, intermountain valleys. Elevations range from approximately 2,000 feet (610 meters) above sea level at the Idaho-Washington state line to 6,844 feet (2,086 meters) at the Idaho-Montana border. Coeur d'Alene Lake has a surface elevation of 2,128 feet (648.7 meters) at full pool. The lake's two principal tributaries are the Coeur d'Alene and St. Joe Rivers which drain the Coeur d'Alene and St. Joe Mountains, subsets of the Bitterroot Range. The lake is drained by the Spokane River, a tributary to the Columbia River.

The Coeur d'Alene and St. Joe Mountains are primarily metasedimentary rocks of the Proterozoic Belt Supergroup which have been locally intruded by granitic rocks of Cretaceous age. The lower elevations to the west of the Coeur d'Alene and St. Joe Mountains are underlain by glaciofluvial deposits and remnants of multiple basaltic lava flows. An important feature in the northwest part of the study area is the Rathdrum Prairie Aquifer, a 409 square mile (1,060 square kilometer) valley-fill aquifer created during the Pleistocene by repeated outburst floods from glacial Lake Missoula.

A generalized description of the major soil types in the study area was derived from U.S. Department of Agriculture (1984). The majority of the mountainous area east of Coeur d'Alene Lake contains soils on mountainsides, formed in volcanic ash and loess over metasedimentary rocks. The mountainous area west of the lake and north of Windy and Rockford Bays contains soil on mountainsides formed in volcanic ash and loess over granite, gneiss, and schist.

Much of the hilly margin of the lake contains two major soil types. The first are soils on undulating to steep hills, formed in deep loess with some volcanic ash influence. The second type are soils on mountainous slopes and canyon walls associated with hills and plateaus; they are formed mainly in basalt with a thin loess cover.

The Rathdrum Prairie Aquifer has soils on glaciated mountainsides, glacial moraines, and associated terraces, formed in volcanic ash overlaying glacial drift and in sandy glacial lake-laid sediments. The lower river valleys of the St. Joe and Coeur d'Alene Rivers contain soils on floodplains and low terraces, formed in silty alluvium.

The study area receives some of the largest amounts of precipitation in Idaho. About 70 percent of the annual precipitation occurs as snow during October to April. The areal distribution of precipitation is influenced by the basin's topography. For example, the climatological station at Coeur d'Alene (elevation; 2,159 feet, 658 meters) has a mean annual precipitation of 25.4 inches (644 millimeters), whereas the station at Wallace (elevation; 2,940 feet, 896 meters) receives 38.3 inches (971 millimeters). Ambient temperature varies throughout the study area

depending on elevation; at Coeur d'Alene, the mean annual temperature is 9.1 degrees Celsius. Although winter temperatures at Coeur d'Alene Lake are often below freezing, in recent decades the lake normally does not freeze except in its shallow southern end.

Coeur d'Alene Lake lies in a naturally-dammed river valley. The lake's outflow is controlled by Post Falls Dam which provides hydroelectric power, flood control, and irrigation supply. At its outlet, the lake receives surface water inflow from 3,741 square miles (9,690 square kilometers). At its normal full pool elevation of 2,128 feet (648.7 meters) above sea level, the lake covers 49.8 square miles (129 square kilometers) and contains 0.67 cubic miles (2.8 cubic kilometers) (table 1). At full pool, the lake's mean depth is 72.2 feet (22 meters) and its maximum depth is 209 feet (63.7 meters). When the lake level is reduced to an elevation of 2,120 feet (646.2 meters), the limit of usable capacity, the surface area is reduced to 47.1 square miles (122 square kilometers) and the volume to 0.62 cubic miles (2.6 cubic kilometers). A bathymetric map of Coeur d'Alene Lake has recently been published by the Geological Survey (Woods and Berenbrock, 1994); a page-size version of that map is illustrated in figure 2. The southern end of the lake contains four shallow lakes, Benewah, Chatcolet, Hidden, and Round, which were flooded in 1906 by impoundment of the Spokane River and Coeur d'Alene Lake by Post Falls Dam.

The Coeur d'Alene River (drainage area; 1,472 square miles, 3,812 square kilometers) discharges into the lake near Harrison. The river has three major reaches, the North Fork, the South Fork, and the reach downstream of the two Forks. Land-use activities within the

Table 1. Morphometric data for Coeur d'Alene Lake at full-pool elevation of 648.6 meters

[km², square kilometers; km³, cubic kilometers; m, meters]

Surface area, in km ²	129
Volume, in km ³	2.84
Shoreline length, in m	243
Maximum depth, in m	63.7
Mean depth, in m	22.0

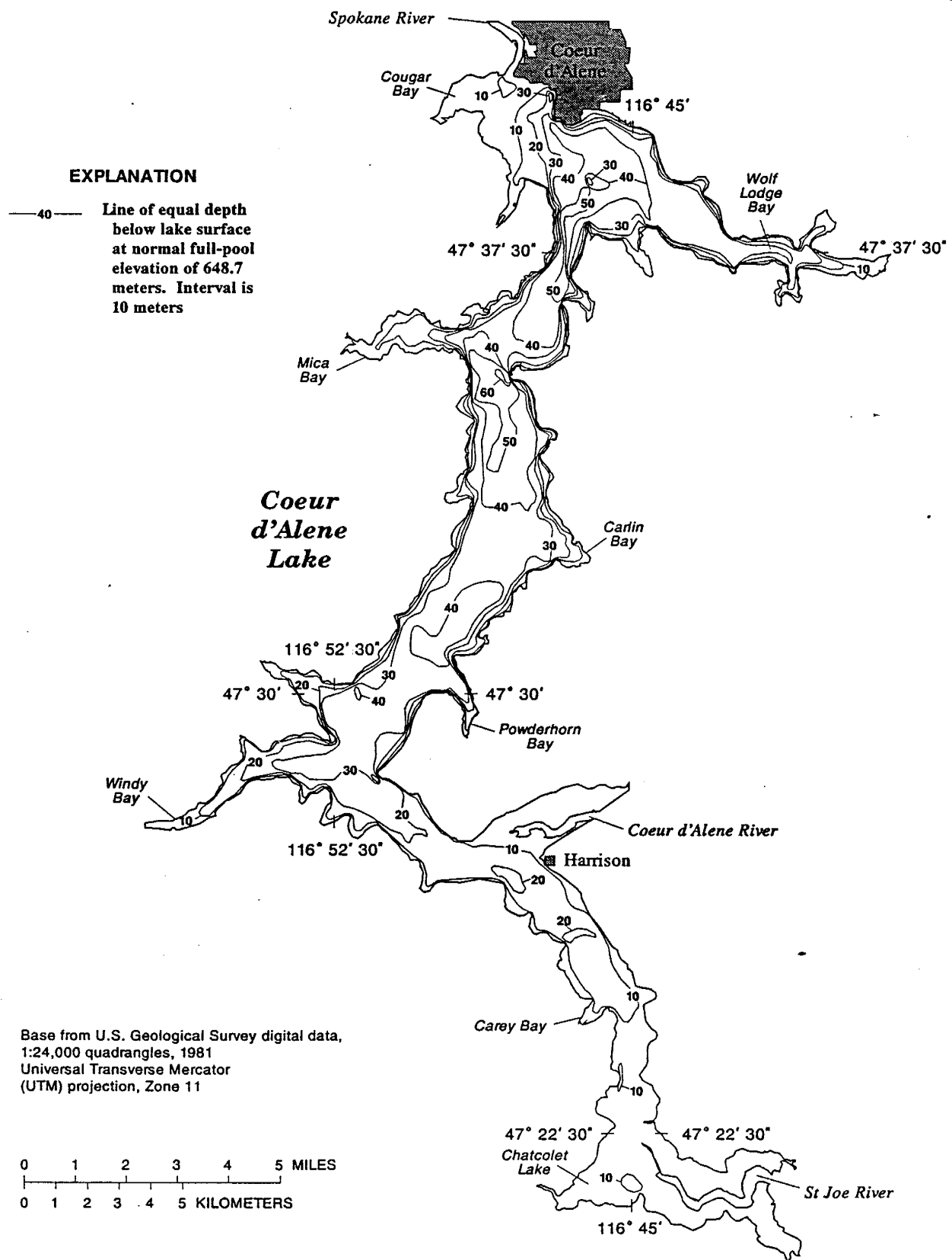


Figure 2. Bathymetric map of Coeur d'Alene Lake.

Coeur d'Alene River basin include recreation, logging, agriculture, mining and ore processing. The majority of the mining and ore processing activities are located in the South Fork Basin which contains the Bunker Hill Superfund Site.

The St. Joe River (drainage area; 1,745 square miles, (4,520 square kilometers) discharges into the southern end of the lake. The St. Joe River is joined by the St. Maries River at the city of St. Maries. Recreation and logging are the dominant land uses; very little mining activity has occurred in the St. Joe River basin.

BIOLOGICAL ATTRIBUTES

Historically, the native fish species abundant in Coeur d'Alene Lake and its tributaries included west slope cutthroat trout, bull trout, mountain whitefish, northern squawfish, peamouth, suckers, and sculpins (Coeur d'Alene Tribe, written commun., 1994). In 1937, kokanee salmon were introduced, beginning the lake's transformation to a sport fishery dominated by introduced species. Other introduced species include: chinook salmon, rainbow trout, brook trout, northern pike, yellow perch, tench, black bullhead, pumpkin seed, largemouth bass, smallmouth bass, and black crappie (Coeur d'Alene Tribe, written commun., 1994).

The extensive forests of the watershed support deer, elk, moose, black bear, coyote, bobcat, cougar, porcupine, squirrel, marten, badger, wolverine, beaver, mice and other small rodents, several species of songbirds, forest grouse, owls, hawks and other raptors, as well as many species of amphibians, reptiles, insects and other invertebrates.

The mainly coniferous forests are composed of firs, pines, hemlocks, cedar, and larch.

Deciduous trees such as cottonwood, alder and willow are found along lakeshores and streambanks, or interspersed among the conifers as are isolated stands of aspen and birch. Many species of grasses, mosses, fungi, and deciduous shrubs blanket the forest floor or grow in open areas.

The region's numerous wetlands and nearshore areas also support an abundance of plant, animal, and bird life. Waterfowl such as Canada geese and several species of ducks are abundant year round, and large numbers, including less common species such as swans and snow geese pass through the area seasonally during migration. Many species of songbirds, water birds, and raptors are also common. These areas also support otter, beaver, muskrat, weasels and other furbearers.

LAND USE AND LAND COVER

The land use and land cover within the study area were classified using remote sensing technology. The classification was performed by the Idaho Department of Water Resources, under contract to the U.S. Geological Survey; their report (Idaho Department of Water Resources, 1993) describes the methods and results and, therefore, will only be summarized here.

Two Landsat TM scenes were classified; they represented recent summer scenes with less than 10-percent cloud cover. Scene 42/27 is a full scene acquired on July 21, 1989. Scene 43/27 is a subscene acquired on July 27, 1989. The scenes were geocoded to a UTM projection and were then blended together to produce a single scene. The total RMS error of the final scene was 16.5 meters. An unsupervised classification approach was selected because of the complexity of the study

area. Image processing and image interpretation procedures were used to produce the following list of 15 land use and land cover classes:

- * dense urban or built-up land
- * sparse urban or built-up land
- * irrigated agriculture and pasture
- * dryland agriculture and pasture
- * rangeland
- * deciduous forest
- * coniferous forest
- * sparse forest
- * recent clearcuts
- * recovering clearcuts
- * water
- * wetlands
- * barren land
- * mined land
- * clouds and cloud shadows

An accuracy assessment was conducted to determine individual class accuracies as well as overall accuracy. The overall accuracy for the classification was 96 percent.

The study area was subdivided into 40 subbasins (fig. 3 and table 2) to provide detailed information on land use and land cover. The subbasins contiguous to Coeur d'Alene Lake comprised 27 of the subbasins. The Coeur d'Alene River's drainage basin was divided into seven subbasins whereas the St. Joe River's was subdivided into five units. The remaining subbasin represented the area between the lake's outlet and the U.S. Geological Survey's gaging station near the Idaho-Washington state line. The detailed breakdown (of land use and land cover for the 40 subbasins) is listed in Idaho Department of Water Resources (1993).

The land use and land cover within the 3,980 square miles (10,310 square kilometer) study area (table 3) is dominated by coniferous forest (51.6 percent) and sparse forest (23 percent). The two agriculture classes represent 5.4 percent of the area whereas recent and recovering clearcuts represent 6 percent. Wetlands represent only 0.23 percent of the land use and land cover. The Idaho Department of Parks and Recreation (1993) has recently published a priority listing of wetland areas. The list gives priority consideration to wetlands that 1) provide a high degree of public benefits, 2) are representative of rare or declining wetland types within an ecoregion, and 3) are subject to an identified threat of loss or degradation. Within the border of Coeur d'Alene Lake, there are the following eleven priority wetland areas:

- * Wolf Lodge Bay/Beauty Bay
- * St. Joe River levees and delta
- * Benewah Lake
- * Cougar Bay
- * Blue Creek Bay
- * Mica Bay
- * Kid Island Bay
- * Loffs Bay
- * Rockford Bay
- * Windy Bay
- * Highway 95 bridge over Coeur d'Alene Lake

SOCIOECONOMIC CONDITIONS

Until recently, the Coeur d'Alene region's economy depended on its abundant natural resources; however, beginning in the 1980's, the mining and timber industries were in economic decline. Tourism became a component of the region's economy in the 1950's as the region's scenic beauty, high

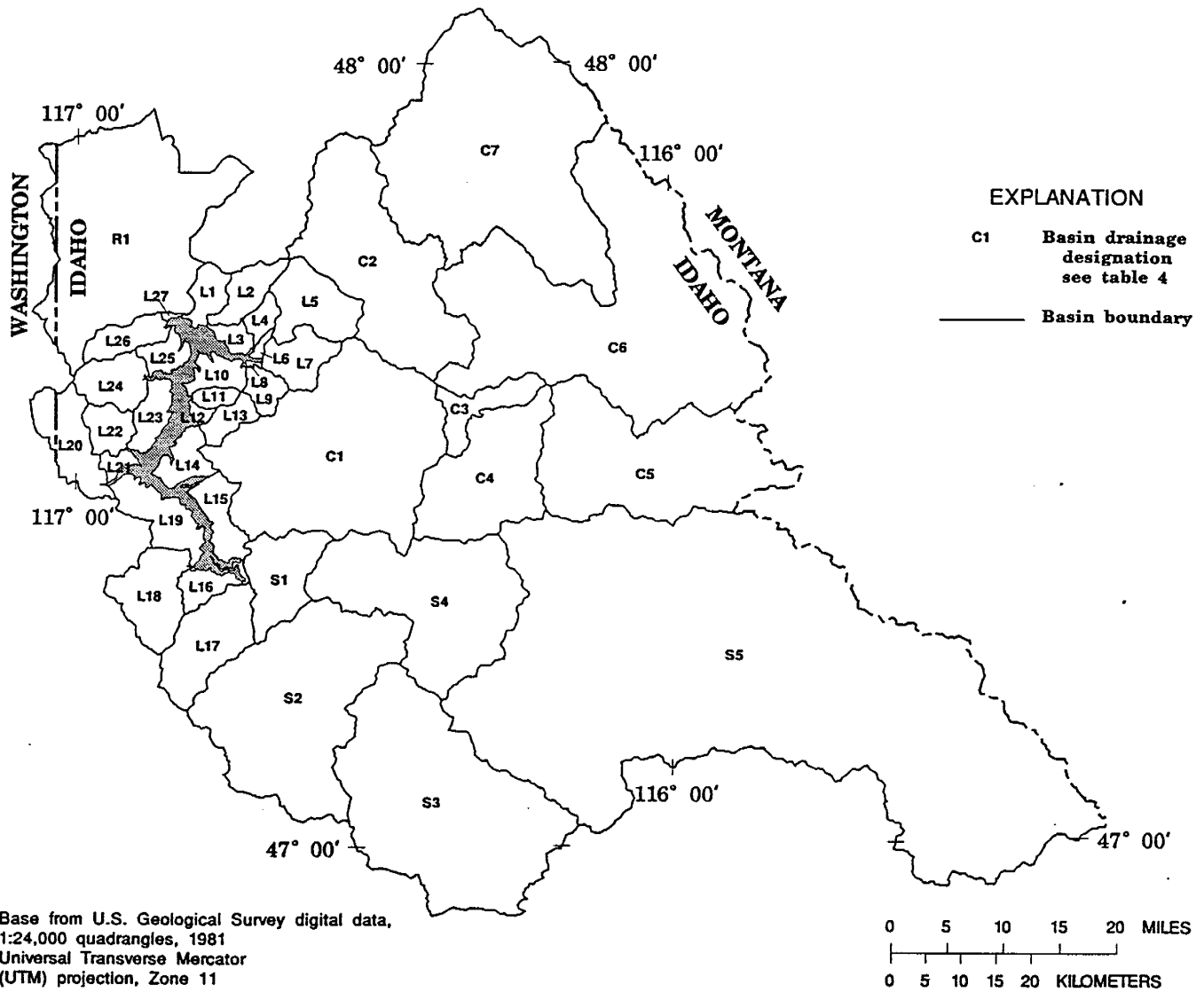


Figure 3. Locations of 40 subbasins within study area.

Table 2. Subbasins and associated drainage areas in the study area[km², square kilometer; L, Lake; C, Coeur d'Alene River; S, St. Joe River; R, Spokane River; USGS, U.S. Geological Survey]

Subbasin No. (fig. 3)	Subbasin name	Drainage area (km ²)	Subbasin No. (fig. 3)	Subbasin name	Drainage area (km ²)
L1	City of Coeur d'Alene	37.1	L27	Cougar Bay, nearshore, northwest	2
L2	Fernan Creek	49.5	C1	Coeur d'Alene River, Harrison to Cataldo gaging station	652
L3	Bennett Bay, nearshore	18.9	C2	Coeur d'Alene River, Little North Fork	445
L4	Blue Creek	20.5	C3	Coeur d'Alene River, Enaville gaging station	67.1
L5	Wolf Lodge Creek	104	C4	Coeur d'Alene River, South Fork, Pinehurst to Elizabeth Park gaging station	270
L6	Wolf Lodge Bay, nearshore, northeast	5.4	C5	Coeur d'Alene River, South Fork, Elizabeth Park gaging station	482
L7	Cedar Creek	62.5	C6	Coeur d'Alene River, South Fork, Pinehurst to North Fork, Enaville to Prichard gaging station	1,020
L8	Wolf Lodge Bay, nearshore, southeast	1.7	C7	Coeur d'Alene River, North Fork, upstream from Prichard gaging station	876
L9	Beauty Creek	28.9	S1	St. Joe River, lake to St. Maries gaging station	117
L10	Squaw Bay to Echo Bay, nearshore	34.2	S2	St. Maries River, St. Maries to Santa gaging station	565
L11	Turner Creek	16.5	S3	St. Maries River, upstream from Santa gaging station	713
L12	Carlin Bay, nearshore	7.2	S4	St. Joe River, St. Maries to Calder gaging station	438
L13	Carlin Creek	31.7	S5	St. Joe River, upstream from Calder gaging station	2,687
L14	Powderhorn Bay, nearshore	44.3	R1	Spokane River, lake outlet to USGS gaging station near State line	624
L15	Harrison to St. Maries, nearshore	54.9			
L16	Chatcolet Lake, nearshore, south	34.3			
L17	BenewahEnaville Creek	138			
L18	Plummer Creek	114			
L19	Windy Bay to Chatcolet Lake, nearshore ..	79.9			
L20	Lake Creek	99.5			
L21	Windy Bay, nearshore, north	14.1			
L22	Fighting Creek	41.6			
L23	Rockford Bay to Mica Bay, nearshore	41.9			
L24	Mica Creek	67.7			
L25	Mica Bay to Cougar Bay, nearshore	29.6			
L26	Cougar Creek	48.5			

Table 3. Land use and land cover in the study area[km², square kilometers]

Land use and land cover classification	Area (km ²)	Percent of total
Coniferous forest	5,260	51.6
Sparse forest	2,350	23.0
Rangeland	688	6.8
Clouds	402	3.9
Recovering clearcut forest	385	3.8
Dryland agriculture and pasture	357	3.5
Recent clearcut forest	227	2.2
Irrigated agriculture and pasture	196	1.9
Water	166	1.6
Dense urban or built-up land	48.9	.48
Cloud shadows	34.6	.34
Sparse urban or built-up land	29.1	.29
Wetland	23.9	.23
Barren land	15.2	.15
Deciduous forest	7	.07
Mined land	4.1	.05
TOTAL (rounded)	10,200	100

quality water resources and abundant outdoor recreation opportunities drew increasing numbers of visitors (Kootenai County Planning Commission, 1993). As the natural resource industrial base declined, tourism, recreation, and associated service and sales businesses became the region's new growth industries. Tourism could be the region's largest industry by the year 2000 (Panhandle Area Council, 1993).

The population dynamics of North Idaho and its five counties (Benewah, Bonner, Boundary, Kootenai, and Shoshone) have been evaluated for the period 1970 to 1990 (Panhandle Area Council, 1993). During that period, North Idaho's population grew 54 percent (82,300 to 126,600) with the largest increase during the 1970's. Bonner and Kootenai Counties experienced the most growth, whereas Shoshone County lost population, particularly during the 1980's. Projections call for as much as 10 percent growth during the 1990's (Panhandle Area Council, 1993).

About 76 percent of the population of the Coeur d'Alene watershed resides in Kootenai County, primarily in the cities of Coeur d'Alene, Post Falls, Hayden, and their immediate vicinities. Kootenai County also contains large portions of the forested and agricultural lands in the watershed. The county also contains a significant portion of the watershed's wetland, especially at the heads of lake bays, along the Coeur d'Alene River, and around the ten shallow lakes adjacent to the river's lower reach.

The county's population has increased by 136 percent over the last thirty years, to 69,795, as reported in the 1990 census. The largest increase occurred during the 1970's (table 4). Some current forecasts predict Kootenai

County to grow as much as 20 percent during the 1990's (Kootenai County Planning Commission, 1993; Panhandle Area Council, 1993). Considering tourists in hotels/motels and part-time residents of second homes, the peak population of Kootenai County may exceed 100,000 in the summer (Kootenai County Planning Commission, 1993). Much of the direct recreational use of Coeur d'Alene Lake and associated tourist-related business occurs in Kootenai County.

The city of Coeur d'Alene (1990 population of about 25,000) is becoming a major year-round tourist destination. In 1993, total hotel-motel and lodging sales in Kootenai County amounted to over \$27 million, based on stated travel and convention room tax receipts. This figure represents at least a fourfold increase over the last decade (Idaho Department of Commerce, 1992; Idaho Department of Employment, 1993). The county also contains most of the lakeshore homesites which are increasingly becoming year round residences. The total 1991 market value of all property in Kootenai County was estimated to be over \$2.3 billion (Idaho Department of Commerce, 1992), with property on (or immediately nearby) Coeur d'Alene Lake accounting for over half that figure (Kootenai County Assessor, written commun., 1993).

Shoshone County is the largest of the three counties making up the Coeur d'Alene Lake basin. It contains much of the rural, mountainous, and forested lands, including the headwater areas of the Coeur d'Alene and St. Joe Rivers. It also contains the Coeur d'Alene Mining District (the Silver Valley). The county's population (about 15.2 percent of the basin's total) has declined by about 29.3 percent since 1970 (table 4). Significant timber harvest and some remaining mining

Table 4. Population of Benewah, Kootenai, and Shoshone Counties, 1890–1990

Population assessment year	Benewah County	Kootenai County	Shoshone County
1890	(¹)	4,108	5,382
1900	(¹)	10,216	11,950
1910	(¹)	22,247	13,936
1920	6,977	17,878	14,250
1930	6,371	19,469	19,060
1940	7,332	22,283	21,230
1950	6,173	24,947	22,806
1960	6,036	29,556	20,876
1970	6,230	35,332	19,718
1980	8,292	59,770	19,226
1990	7,937	69,795	13,931

¹Benewah County was combined with Kootenai County until 1915.

activities occur in Shoshone County.

Although Shoshone County's economy has not fully recovered from the decline of the mining industry, diversification efforts are underway (Panhandle Area Council, 1993). The city of Kellogg is developing a major mountain resort to attract skiers and sightseers. Hotel-motel and lodging sales in Shoshone County amounted to \$1.8 million in 1991, or about three times that of 1983 (Idaho Department of Commerce, 1992). This trend is expected to continue as plans to develop tourism based on the Silver Valley's mining history are pursued (Hudson, Jelaco, Welch, Comer, 1993). Environmental cleanup and mine restoration technology and services may also emerge as an industry in the future.

Benewah County is the smallest in both area and population of the three counties comprising the Coeur d'Alene Lake basin (table 4). It was part of Kootenai County until 1915. While its population increased 27.8 percent from 1970 to 1990, the county actually declined 4.3 percent during the 1980's, possibly related to recent declines in the timber industry (Panhandle Area Council, 1993). Benewah County contains much of the productive agricultural land in the basin.

Forested areas in the lower St. Joe and St. Maries River drainages support extensive timber harvest. Major forest products processing mills are located in the county. St. Maries is as the county seat and a major transshipment point for logs. Many are towed down the St. Joe River and across the lake to mills in Coeur d'Alene. Benewah County has one of the largest sources of placer-mined industrial and gem grade garnets in the nation. The county is also becoming a major producer of wild rice from wetlands and flooded fields

along the lower St. Joe and St. Maries Rivers. Heyburn State Park, one of the largest and most heavily used in the state is in the county. However, the recreation/tourism business potential of the county remains largely undeveloped (Harris and others, 1989).

The Coeur d'Alene Tribal aboriginal homeland covered almost five million acres in what is now northern Idaho, eastern Washington and western Montana. The heart of this homeland is the Coeur d'Alene Basin, including both river and Coeur d'Alene Lake. The Tribe's presence here dates to time immemorial. Until the coming of European culture and eventual reduction of Coeur d'Alene lands to the current reservation, the Tribe enjoyed a vast wealth of natural resources. Almost everything Tribal members needed--wildlife, fish, water potatoes, huckleberries, camas root and other food sources--was easily at hand. These natural resources were and are essential to maintaining tribal culture and customs. History shows that tribal members camped along the banks of the lake and traveled along its tributaries and ridges via canoe, horseback and by foot. Archeological digs reveal encampments from the northern shore of Lake Pend Oreille to the Spokane Valley, then south and across the existing state line to the upper St. Joe River valley. These encampments represented scores of families and bands, all part of the Coeur d'Alene Tribe.

The existing 1,400 square mile Coeur d'Alene Indian Reservation was established in 1891, encompassing parts of Benewah and Kootenai Counties. It includes only a small portion of the original 4,000,000 acres that was the traditional homeland of the Coeur d'Alene Indians. Under the Indian Reorganization Act of 1934, the Tribal Council was formally

recognized as the ruling body of the Coeur d'Alene Tribe; a governing Constitution was approved and adopted by the Tribe in 1947.

The Tribe has evolved into an economic force in northern Idaho with expanding Tribal commercial, health and environmental programs which are self-determined and self-governed. Of the approximately 6,000 residents within the reservation boundaries, only 750 are Coeur d'Alene Tribal members (about 550 other tribal members live outside of the reservation).

The major communities within the reservation boundary include a part of the Benewah County seat of St. Maries plus Plummer, Worley, Tensed and DeSmet. Tribal headquarters are located near Plummer. The tribe operates farming, logging, construction, retail businesses, a school system and a health care facility (Coeur d'Alene Tribe, written communication, 1994). The tribe recently constructed and is operating a bingo hall near Worley, and is exploring other tourism, recreation and service enterprises.

Of the 345,000 acres that comprise the reservation, about 58,000 acres are in Indian ownership. About 197,000 acres of the reservation drain into Coeur d'Alene Lake. Approximately one-third of Coeur d'Alene Lake lies within the Coeur d'Alene Indian Reservation, but the Coeur d'Alene Tribe does not own or control any lakeshore frontage. West and southwest of the lake, the reservation is dominated by agricultural uses on very fertile but highly erosive Palouse soils. In contrast, the reservation's east side is largely timber producing land. The natural world and all that are in it are paramount to Coeur d'Alene Tribal culture and heritage. The stewardship of the basin's environmental

remain a critical issue of tribal government.

LAKE USES

Coeur d'Alene Lake is heavily used for recreational boating and fishing. Although Kootenai County contains only 6.9 percent of Idaho's boatable water, 18.5 percent of the state's boats are registered in the county. This number increased by almost 62 percent in the last five years, from 12,800 in 1988 to 20,800 in 1992 (U.S. Bureau of Land Management, 1993). A large number of Coeur d'Alene Lake boaters are from outside the state. Of the 10,000 out-of-state boat registrations in Idaho, a little over half of the owners declare Benewah and Kootenai Counties as their primary area of use; out-of-state boaters account for about one-fourth of the 20,000 boats registered in Kootenai County (Idaho Department of Parks, written commun., 1993).

Coeur d'Alene Lake is probably the region's major attraction as a recreation and tourist area. A large lakeshore resort in Coeur d'Alene continues to expand, especially after the addition of a golf course on the site of a former sawmill on the city's eastern edge. Many public and private recreation areas, ranging from simple boat launch ramps to campgrounds, picnic areas, and interpretive trails, are also located on the lake (table 5). A recent recreation management plan describes in greater detail the characteristics and services offered at each site (U.S. Bureau of Land Management, 1993). The cities of Coeur d'Alene, Harrison, Post Falls, and St. Maries operate popular parks offering picnic and/or camping facilities and water access for boating and/or swimming.

Within a 50 mile (80 kilometer) radius of the city of Coeur d'Alene are numerous lakes that

Table 5. Public and private recreation facilities at Coeur d'Alene Lake

[D, docks; T, toilets; DW, drinking water; BR, boat ramp; C, camping; RS, rental boat slips; data from Bureau of Land Management, 1993]

Facility name	Services available
Public	
North Idaho College beach	D, T, DW
Third Street beach	BR, D, T, DW
Booths Park	BR, D, T
I-90 boat launch	BR, D
Higgins Point	D
Wolf Lodge Bay	BR, D, T
Squaw Bay	BR, D, T
Turner Point	D, T
Turner Bay	D, T
Carlin Bay	BR, D
Bell Bay	D, T, DW, C
Harlow Point	D
Mowry State Park	D, T, C
Windy Bay	D, T, C
Sun Up Bay	BR, D, T
Rockford Bay	BR, D, T
Loffs Bay	BR, D, T
Mica Bay boat park	D, T, C
Mica Bay	BR, D, T
Goulds Landing	BR, D, T
Rocky Point Marina	D, T, DW, BR, RS
Chatcolet, day use	D, T, BR
Plummer Point	D, T, DW
Howleys Landing	D, T, DW, C
Private	
Boardwalk Marina	D, RS
Yacht Club Sales	BR, T, DW, RS
Northwest Resort	BR, T, DW, RS
Silver Beach Resort	D, RS
Delevans Marine	RS
Wolf Lodge campground	T, DW, C
Coeur d'Alene Lake Resort	D, T, DW, C
Beauty Bay Resort	D, RS
Squaw Bay Resort	BR, D, T, DW, C, RS
Panhandle Yacht Club	RS
Arrow Point RV Park	T
Arrow Point Resort	D, T, DW
Carlin Bay Resort	D, T, DW, C
Conklin Park Marina	D, T, DW, BR, RS

Table 6. Lakes within an 80-kilometer radius of the city of Coeur d'Alene

[km², square kilometer; —, no data available]

Lake name	Surface area (km ²)	Lake name	Surface area (km ²)
Idaho lakes		Idaho lakes—Continued	
Anderson ¹	1.2	Pend Oreille.....	330
Black ¹	1.4	Porter.....	.1
Blue ¹8	Rose ¹	1.4
Bull Run ¹3	Round.....	.2
Cave ¹	2.4	Spirit.....	5.2
Chilco.....	—	Swan ¹	1.5
Fernan.....	1.4	Thompson ¹8
Granite.....	.1	Twin.....	7.8
Hauser.....	2.4	Washington lakes	
Hayden.....	17	Liberty.....	2.8
Kelso.....	.2	Long Lake.....	21
Killarney ¹	1.9	Newman.....	4.9
Medicine ¹7		

¹Lateral lakes adjacent to Coeur d'Alene River.